

Telemedicine Across the World

An Honors Thesis (HONR 499)

by

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Abstract

Medicine has constantly changed and evolved with the inventions of new technologies. Telemedicine is one of those newest innovations that has been growing rapidly in local settings over the last decade. In this thesis, my goal is to explain the purpose of telemedicine, the benefits of it being utilized internationally between developing and advanced countries, and to propose solutions on how to overcome many of the obstacles facing practical international telemedicine.

Acknowledgements

I would like to thank Dr. Jason Powell for being my thesis advisor and challenging me to pursue a project that would challenge me as well as bring me a greater passion and appreciation for the health of people in developing countries.

Thank you to my father, who I formally interviewed once, but also allowed me to throw ideas for this thesis at him throughout the writing process.

Thank you to all of my family and friends who have encouraged me to pursue a career in medicine and helped teach me the importance of caring for others around the world who do not have access to the same luxuries many have in the United States.

Lastly, I would like to thank organizations such as Ball State Cru, Filter of Hope, and Global Medical Brigades for giving me opportunities to travel the world serving others who desperately need it.

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Process Analysis

Writing my Honors Thesis has been a much more positive experience than I expected it to be. Honestly, this was a process that I had been dreading for my first three and a half years at Ball State. As I was entering my last semester of college, I had still not picked out a topic that I really wanted to pursue for my thesis. Luckily, I was accepted into the Honors Thesis class, which provided me with structure, deadlines, and a helpful advisor that pushed me into pursuing a thesis topic I really cared about. Eventually, I decided to pursue a creative project about my experiences in developing countries over the last year and a half and how my background in telemedicine led me to understand international telemedicine capabilities between the United States and Nicaragua.

My desire to pursue this topic came from my background in medicine, my connections to telemedicine, and my recent trips to developing countries. My background in medicine began as a child, since my father is a Pediatrician. He would often times come home from the hospital with a variety of stories about his day to day routine. I really enjoyed these stories since it gave me a glimpse into what it was like to be a doctor and how he was able to help so many people on a daily basis. He also took my siblings and I to his office on occasion, where we would get to see his work space, meet his nurses, and interact with various medical tools. These experiences gave me an appreciation for medicine and became one of my motivations for pursuing Pre-medical preparation and Biochemistry degrees here at Ball State.

My father also gave me a connection to telemedicine that I would not have had otherwise. He was chosen to be a part of the pilot program for telemedicine in Indiana. This allowed him to experience the pros and cons of telemedicine without being influenced by the opinions of other doctors in his area. His experiences have been a great asset to me, as I have had multiple

conversations with him about his ideas and experiences with telemedicine. This information was very beneficial and helped shape my thesis into the best product it could be.

My last background influence that helped form my thesis was my several trips to developing countries over the last year and a half. In the spring of 2017 and 2018, I had the opportunity to travel to Haiti and El Salvador with Ball State's Cru and Filter of Hope to install water filters in the homes of impoverished people in these countries. We went home to home, installing water filters in some of the poorest regions of the countries. People were beyond grateful to receive these water filters since much of their life revolved around trying to obtain clean water. In Haiti, most people either have to choose between spending most of their income on bottled water, or just risk getting themselves and their children sick from drinking river water. In El Salvador, people either drink tap water, which contains unsafe amounts of chlorine, drink contaminated river water, or pour bleach into their water to try and kill the bacteria and parasites in it. After we were able to bring these filters, the lives of these people were able to radically change for the better.

In the late spring of 2017, I also had the opportunity to travel to Nicaragua with Global Medical Brigades to do a variety of volunteer work, but mostly to set up medical stations where people in some of the poorest regions of Nicaragua could come and receive medical care. This was also an incredible experience because there were so many people sick with illnesses that would normally be treatable in the United States, but since they lived in rural areas without access to advanced medicine, many just remained sick. It was impactful to see the need of some people who walked up to six hours to receive medical care. All three of these trips showed me the desperate need there is around the world for better access to medicine, which helped inspire

my idea of utilizing telemedicine to allow healthcare professionals in these developing countries to communicate with countries like the United States that have advanced medicine.

Even after all of these experiences, it still took me a long time to come up with a topic I cared about for my thesis. I entered the Honors Thesis class having the vague idea to write about the differences in healthcare between the United States and developing countries like the ones I had traveled to. After some consideration though, I knew this topic was too broad, and because of that I was not very interested in pursuing it further. After some discussions with my advisor, I soon decided on working on a creative project about creating the technology necessary for telemedicine to exist between the United States and Nicaragua. Unfortunately, this idea also proved to be futile after limited research showed that the technology already exists for international telemedicine, and that there are a variety of other reasons why many countries are not taking advantage of this technology. Finally, I decided to write my thesis about dealing with many of these problems and chose Nicaragua as the country to focus on. Again, my topic had to slightly change. Soon after I began my research, I realized that utilizing telemedicine between the United States and Nicaragua is not currently possible. There are too many obstacles in Nicaragua, including its limited internet access, its internet access being controlled by monopolies, and its rough, diverse geography. Because of this, my thesis has evolved into a paper discussing these problems and potential solutions that I present for each obstacle.

I have mentioned several times the results of my research, but researching was one of the most difficult processes in working on my thesis. There was very limited data pertaining to the internet availability in Nicaragua, let alone how that changed in different regions of the country. I searched through numerous websites, both peer reviewed and not, along with books from the library. Out of all of those resources, I was still only able to find a few numerical facts about the

state of Nicaragua's internet access. Even when I did find information about this topic, the data I obtained was several years out of date, which made my results less reliable. Researching this topic was also difficult due to the language barrier between Nicaragua and the United States. Oftentimes as I was viewing a website from Nicaragua, Google Translate would attempt to translate the page I was viewing, but the translations were not always comprehensible.

Luckily, researching internet availability was by far the most difficult part of the researching process. As I researched other topics, such as the geography of Nicaragua, the availability of medical interpreters in both Nicaragua and the United States, and the topic of telemedicine, these topics all had reliable sources I could draw information from. I was able to find an incredibly helpful book at the library that gave me much of my statistics regarding the importance of using medical interpreters and how they have been misused in the past.

While this has been a long and at times difficult project, writing my thesis has taught me much about myself. I mentioned earlier that the topic I chose was not my first choice and even changed several times as I was researching my topic. One thing I noticed as I was researching my topic was that as I learned more about the topic I was researching and became more invested in it, the process became much easier. As I cared more about the topic I was going to write about, I found myself much more willing to research it and to search deeper for the information I wanted to find. The same concept was true for the writing process of creating my thesis. The more invested and interested I became in my topic, the easier it was to write about. Being motivated to write not only made the writing process less painful, but also sped it up significantly.

Something else I learned as I wrote my thesis was that I am very passionate about helping people in developing countries. While I have already known this after traveling to several

foreign countries in the last year and a half, I have really enjoyed working on solutions that could improve the lives of those people in the future. I have also enjoyed this because telemedicine allows people to help those in foreign countries without the need for taking distant trips. If telemedicine can be utilized in the way I suggest in my thesis, many more people in these foreign countries would benefit simply because it would be become much easier for doctors in the United States to help them.

Lastly, I have learned that I work much more efficiently when I am surrounded with structure and deadlines. One of the reasons I had avoided thinking about my thesis topic for so long before my last semester was because I did not fully understand what creating a thesis would entail and how I could possibly complete a large project like that in one semester. Being accepted into the Honors Thesis class was the absolute best solution to my problem. The deadlines and structure given in the class syllabus has helped me work on my thesis in small portions as opposed to viewing it as one enormous project. The opportunity to bounce ideas off of my classmates and my advisor multiple times a week was also very beneficial to me.

Overall, my experience creating my thesis has been a positive one. I have been able to learn much more about the country of Nicaragua and the potential of telemedicine. I have grown in my researching and writing abilities as I have worked through the obstacles in creating this project. I have also learned a fair amount about myself and what I am passionate about.

Telemedicine Across the World

Telemedicine is a relatively new approach to medicine that I believe will change how medicine is perceived and performed. Telemedicine allows doctors and other health professionals in different disciplines to communicate about and with patients via a videochat platform. Currently, this technology is being used locally in the United States more often than not. An example of how telemedicine is currently being applied is that it allows doctors to converse with nurses in a different practice who would like another perspective or a second opinion about a diagnosis with a patient they are treating. Thus far, telemedicine has been useful for providing medical care to rural areas that would not have been able to receive it otherwise. I have travelled to three developing countries in the last two years and have witnessed firsthand how this technology could be incredibly beneficial, if it were utilized, to give people in these nations the option of speaking with doctors that have greater knowledge of medicine than is available where they live. While utilizing telemedicine internationally could benefit many countries, I will specifically be focusing on how to bring this technology to Nicaragua since I have spent time medical-volunteering there. Utilizing telemedicine to be performed internationally between Nicaragua and the United States would benefit that developing nation greatly, but unfortunately, a variety of obstacles stand in the way of this becoming a reality. Currently, using telemedicine in Nicaragua is not possible because of its lack of internet availability to portions of their country, the geographical obstacles that block further internet growth, the monopolies that control this internet access, and the lack of medical interpreters necessary to allow effective communication with the United States.

Before these concepts are explained further, I would like to share a little bit about myself and the purpose for why I am passionate about this subject. I have been exposed to the field of

medicine for the majority of my life. My father is a Pediatrician, so I have grown up hearing a variety of stories about what it takes to be a doctor. A few examples include him describing how he would search for specific illnesses when he was examining patients, or how he would occasionally explain to me why he gave the advice he did to people who called him with different problems. In addition to that, my father was also the first doctor in Indiana to use telemedicine, which allowed me to see firsthand some of the biggest advantages and disadvantages to this new approach to medicine. He has been practicing telemedicine for a few years now and agreed to be interviewed about his experience with telemedicine, his views on the benefits and drawbacks to telemedicine, and how he believes it can be used internationally in the future. The following is a transcript of this interview.

Jacob Zentz: Since you were in the pilot program for telemedicine in Indiana, what were your thoughts before you started performing telemedicine versus after you've been doing it for a while.

Dr. Robert Zentz: My thoughts beforehand were being concerned about doing exams on people when I couldn't touch them.

JZ: Were your concerns basically not being in the same room as them?

RZ: Not really, there are things that I do in an exam that require me to touch a person, like feel their belly, their lymph nodes, or if their skin is warm or anything like that. There are things that

require me to touch someone, and when I can't do that, I feel like I haven't done a full exam on someone.

JZ: Is that still your thoughts on telemedicine?

RZ: It's still a concern for me. I'm able to make diagnoses, like if someone has a bad ear I can see that, or if they have a positive flu test I can treat that accordingly, but I can't fully assess them because I can't touch them. I had other concerns as well.

JZ: Like what?

RZ: The big push right now in medicine is to have what is called a patient-centered home, which is when you only have one doctor you see. That person knows you, and can incorporate what they know about you into their care. I mean, maybe you have had five ear infections in the last six months, but your doctor doesn't know that because you did not go to them for those problems. It's really a concern because maybe someone put you on medicine that your regular doctor knows you don't do well with, or maybe you would have a side effect to a certain medicine that the med-check doctor or telemedicine doctor might not know about. It's a little bit of a concern. I mean, a patient is supposed to give you a full history, and I'm supposed to have papers beforehand that give me that history, but that's not as reliable as knowing the person.

JZ: Do you think the technology involved with telemedicine will improve in the future and could help with this problem? Specifically, technology like stethoscopes or other tools could reach a point where it's not that much different than being physically present with the patient?

RZ: Yeah, I think that technology will improve and that it will help doctors make “easy” diagnoses, or things that are not very difficult to diagnose, but I am actually more concerned with the long-term problems. Specifically, what if the patient has a chronic problem that I’m missing because I’m just taking care of this short-term problem, or if the patient isn’t having their chronic problem taken care of because they are doing these med-check things so you don’t have someone who knows them and can put the whole picture together. If you see different people for different things, the problems might individually not look like a big deal, but if you know all those different problems, then you can maybe see a deeper problem.

JZ: I definitely agree. On a different note, have you ever thought about international telemedicine before?

RZ: No, I’ve never thought about it before. There are times when if that’s all you can get or all you can do, then telemedicine is a great idea. If you’re talking about a country that wouldn’t have access to a doctor otherwise, then you definitely want to do that. If you are talking about another country though, there is the added concern about the language barrier.

JZ: Yes, if you were dealing with language barriers, you definitely need a medical translator.

RZ: Right, but also, whenever you add an interpreter, you’re adding an additional factor to deal with. You lose a little more of that connection with the patient.

JZ: What if this kind of telemedicine dealt less with the diagnoses of a patient, but instead had doctors in developing countries, where medicine is very underdeveloped, using doctors in developed countries like the United States more as consultants?

RZ: I think that would give me a better sense of comfort since I am just helping them make a decision, but the difficulty I would have would be knowing all the medical options available for them in their country. Like, what medicines do they have available that I can choose from because their medicine might be more limited or they might be more limited financially than a patient here. Knowing the medical options is important, plus you have to trust the physician calling you. I mean, if you don't know them, they might not be very good at exams. You really would want to build some kind of relationship with the people that call you, so you can feel comfortable with them doing exams and giving you accurate patient histories.

JZ: Yeah, a lot of these concerns have come up while I have been researching this topic.

RZ: Yes, but if you're talking more about just parts in the world where there isn't access to a good doctor, then I say it's worth it. Where I am at now, there's access to healthcare, so you don't really need telemedicine, but when you're talking about a developing country that wouldn't have access to a doctor otherwise, then it is definitely better than nothing. I think there is a lot of value in that and that it's a really good idea for some people. For international healthcare, I think the possibilities are amazing, and in most countries, you can find Spanish speaking doctors that are specialists in different areas.

JZ: Absolutely. What do you think about the concern you mentioned earlier about what happens if a doctor in the United States is consulting and recommends a certain procedure, but that procedure is not available in Nicaragua?

RZ: Well the things that we do in the United States might be totally different than some of the procedures they do in Nicaragua. They might have different laws on ethical procedures or other examples like that, but there are training courses that people can take that talk about third world medicine and doctors that really want to do this can take courses in that. Also, if they work with doctors in Nicaragua for a long time, they will become more familiar with what is available to them there. I think there are a lot of positive things about international telemedicine and that it could definitely be an option. It would just take some time to learn what kinds of procedures were available so they could work in those parameters. And that could also be getting used to the person that is calling you. If you're talking to a doctor or a medic doing the initial exams on people, it could take some time to trust that they are doing everything correctly.

JZ: Yeah, I think it would be a great idea to try and set it up so you could maintain a relationship with one or two people in Nicaragua that you routinely work with. Okay, I don't have any more questions for you, so thank you!

RZ: No problem.

I have also had the opportunity to do volunteer work in Haiti, Nicaragua, and El Salvador in the last two years, which has shown me the desperate need for improved health in those

countries. In Haiti, and El Salvador, my group would go home to home installing water filters to those who did not have access to it. When we arrived, many people told us stories about children they knew that had died from drinking bacteria-infested river water. This was even more visible in some of the poorest communities since many of the younger children had some sort of sickness from the water and were not able to wear pants because of their consistent intestinal problems. People were beyond grateful to receive these filters and would often cry or become speechless as we drank their newly filtered water first to show them it was safe. In Nicaragua, while dirty water was still a problem, my group was more focused on setting up medical clinics to help those who had been infected with parasites, had teeth that needed to be removed, or had other problems. We also had the opportunity to teach them some basic hygiene principles and passed out hundreds of toothbrushes, tubes of toothpaste, and bars of soap.

I am also about to graduate with a degree in Pre-med/Biochemistry, with the intent of studying further to become a doctor. All of these experiences have given me the desire to help others and to create a way for doctors in developed countries like the United States to be able to assist people in developing countries like Nicaragua. I believe that creating a way for doctors in Nicaragua to have options like getting second opinions from doctors in the United States has the potential to greatly benefit the health of their nation.

Like I mentioned earlier, there are many advantages and disadvantages to using telemedicine. The first and main disadvantage many doctors see in using telemedicine is simply that it is always better to be physically present with patients when they are being diagnosed or treated. As it can be seen by observing the interview with my father on this subject, one of the main reasons for this concern is that if a doctor is not physically present with the patient, he or she is relying on a different healthcare professional to be relay completely accurate information

back to the doctor. While many healthcare professionals would have no trouble assessing patients, it is still difficult for doctors to have complete confidence in their diagnoses when they were not the ones completing the patient's exams. While I absolutely agree that this is a valid concern, I also believe that telemedicine is still a valuable tool that should be used when patients would have very little to no access to doctors near them. Telemedicine still allows people who would not have had the opportunity to be seen by a doctor to now have that opportunity. Also, in reference to local telemedicine, a doctor is always able to tell patients that they need to see him or her in person if the doctor feels unsure about their diagnosis in any way. While the distance makes this option unavailable when dealing with international telemedicine, doctors in the United States would serve more as a second opinion, which would excuse them from needing to see the patient in person.

Similarly, many doctors are also nervous about depending on other health care professionals to record vitals or other measurements as accurately as they would have themselves. Again, I believe this is a valid concern, but it is one that should not dissuade doctors from considering using telemedicine at all. Doctors are capable of seeing and hearing measurements of a patient through special instruments that either show video from the instruments on the doctor's screen or relay sounds like heartbeats through the doctor's speakers. A popular example of this is that a health care professional can use a multi-purpose camera and scope to allow a doctor to see a patient's ears or nose in real time on his/her screen. Another example is that health care professionals can use a retinal camera to show the eyes of a patient to a doctor of their screen. These instruments work well enough that doctors are able to see and hear accurate representations of the patient's conditions. In addition, technology will only

improve in these areas in the future, which will allow doctors to see or hear even better than they can now.

One of the benefits to growing international telemedicine is that it would allow doctors who have a desire to help others around the world to do so without the need to travel. Currently, many doctors who have a desire to serve others around the world will join groups like Doctors Without Borders and travel to help those they can. While many doctors might have this desire, they may not be able to join groups like these because health reasons prevent them from traveling long distances or they simply do not have time for extended trips, which limits them to treating people in the United States. While it is certainly important to treat people in the U.S., there are doctors, including myself in the future, that aspire to help those around the world as well. Making international telemedicine more practical would allow these doctors to fulfill a passion that they were not capable of doing before.

As mentioned earlier, telemedicine is based mainly through videochat, so the technology for using international telemedicine between the United States and Nicaragua already exists. Unfortunately, under the present circumstances, effective international telemedicine is not currently possible in Nicaragua. The greatest reason for this by far is due to its lack of internet availability. There is very little information available about the currently state of Nicaragua's nationwide internet access, but according to Lonely Planet, only 93% of the population of Nicaragua has access to the internet ("93% of the population in Nicaragua, has access to Internet," 2008). While that may seem like a high percentage, 7% of a country without internet is a substantial amount. That 7% is especially important since those people without internet access are likely the people that do not live in cities and are in greater need of telemedicine. In

addition to that, just because internet access is available to 93% percent of the population does not mean that all of them are able to afford it.

There are several reasons why there is a substantial population of Nicaragua still without internet access. First of all, there are many geographical obstacles that make it nearly impossible for lines to be laid in the more remote regions of the country. Specifically, Nicaragua has the largest expanse of rainforest north of the Amazon, which covers much of its northern and eastern regions. In addition to that, there are 24 volcanoes and countless small bodies of water throughout the nation (Topography, 2018). Due to these obstacles, much of the internet access in Nicaragua is received wirelessly, but that comes with its own set of technological problems. For example, there are a few monopolies that control all the internet access in the nation.

Specifically, the two biggest are Claro and Enitel. Claro largely monopolizes the wireless portion of the internet access in Nicaragua, while Enitel monopolizes the fixed lines in the country (Blanco, 2015). Due to the lack of competition in their market, internet access remains too expensive for many people. This also shows why there has been little motivation for these companies to expand internet access into the more remote regions of the country, since that population is some of the poorest in Nicaragua and would not be able to afford internet if it was available to them. As an additional note, while I was in El Salvador, I also noticed that every dish I saw on houses belonged to Claro as well. After further research, it was revealed that Claro not only monopolizes Nicaragua's internet access, but also the internet access in El Salvador, Honduras, and Jamaica (Golding, etc. 2011).

In 2015, Nicaragua's government attempted to address this situation by trying to pass a bill that would give control of Nicaragua's internet access to the state. Unfortunately, if this bill had passed, it may have resulted in even worse conditions for the Nicaraguan people. Before

going into specifics, it is worth noting that no other sources about this bill could be found, so the information regarding the consequences of this bill could likely be the result of corporate propaganda. For this reason, the following statements should not be taken as absolute truth, but should be viewed from the perspective that they were written by supporters who wanted big, private enterprises to continue controlling the market. According to those sources, the price of internet would have increased even more, which would have prevented any additional people from using the internet even if it was available to them. In addition to that, this bill would have given Nicaragua's government access to confidential information for state institutions and private companies. Fortunately, representatives from the Superior Counsel of Private Enterprise (COSEP) fought hard against this bill and did not allow it to pass (Blanco, 2015). The downside to this situation is that to this day, Claro and Enitel are still huge monopolies that are not interested in providing the whole country of Nicaragua with affordable internet access. If international telemedicine is going to occur in Nicaragua, either the country will have to wait many more years for these companies to eventually reach the remainder of the country, or the government will have to provide better legislation that would reduce these monopolies.

In addition to changes needing to be made in Nicaragua, there are some changes that need to be made in the United States as well before international telemedicine in Nicaragua can become a reality. One of the biggest is that the medical interpreter profession needs to grow more. Medical interpreters are absolutely essential when a situation exists where a doctor is addressing someone who speaks a different language. While this seems obvious, it has been a major problem in many hospitals in the United States over the last few decades. Some doctors that are under pressure to treat patients quickly may use family members of the patient as interpreters. This is very unsafe as family members were likely not trained in medical

terminology, which could lead the doctor to believe something incorrect about the patient's condition. In addition, the patient could misunderstand the doctor about what his/her problem is. Unfortunately, many patients are unaware that they are legally obligated to have a medical interpreter with them if one is needed. It is actually illegal to force a family member to act as a medical interpreter since it violates the concept of patient privacy and protected health information enforced by the Health Insurance Portability and Accountability Act of 1996 (HIPPA) (Ortega, 2016, p.446).

Rice (2014) explains how some doctors have also occasionally used bilingual clinical staffers as interpreters. While this seems better, it is still not safe because they are not specifically trained to interpret medical terms like medical interpreters are. Medical interpreters also typically have experience living in communities for at least one year that speak the language they will be interpreting ("Become a Spanish Medical Interpreter: Step-by-Step Career Guide", 2018). This is an important distinguishing factor between medical interpreters and bilingual individuals because medical interpreters can understand cultural references or other subtle language uses that provide them with a more accurate interpretation of what the patient or doctor is saying.

As the United States grows in its non-English speaking population, the necessity of medical interpreters is also increasing. According to the Bureau of Labor Statistics, a 2013 census found that the number of families that spoke a language other than English in their homes has increased by 158% in the last 20 years. Fortunately, it appears as though this demand is being met accordingly. Again, according to the Bureau of Labor Statistics, employment of interpreters and translators is growing rapidly and is projected to increase 46% by 2022 (Rice, 2014). This is not surprising, considering that it is fairly easy to become a medical interpreter if

you are fluent in more than one language. A bachelor's degree in this field is required, certifications are not required, although they are sometimes helpful in obtaining employment, and while experience is usually required, there are many internships or volunteering opportunities available for those who need them ("Become a Spanish Medical Interpreter: Step-by-Step Career Guide", 2018).

It is also worth mentioning that there are multiple types of medical interpretation. The first is an on-site professional interpreter. This is a person that has received the appropriate training to be a medical interpreter. They are also typically present while they are interpreting. Some hospitals have hired in-house medical interpreters if they are near an area with a large population of people who speak a language other than English (Ortega, 2016, p.445-446). I believe that this is the type of medical interpreter that should be used for international telemedicine since it seems unlikely interpreters would be able to perform their jobs well if they were not physically present with the doctors.

The second type of medical interpretation is the remote professional interpreter. These interpreters provide interpretation through various avenues outside of being physically present with the patient and doctor. Some examples include video, telephone, or other remote connection. Telephones are especially common, and some hospitals will make contracts with specific telephone interpretation systems for this purpose. The type of remote interpretation depends on the equipment available in the hospital in question (Ortega, 2016, p.446). Again, I do not believe that this would be a realistic option for international telemedicine since it would create a third location people would be speaking to, which would unnecessarily complicate the process.

The last two options for medical interpretation are staff (nonprofessional) interpreters or family members. As I mentioned earlier, these are options that some doctors have used in the past, but should never actually be used. Using anyone other than a professional medical interpreter endangers the patient and should be avoided (Ortega, 2016, p.446).

While it appears that the medical interpreter profession is rapidly growing in the United States, I could find very little information about medical interpreters in Nicaragua, which suggests that there are much fewer there. This is not devastating by any means, since only one medical interpreter is needed while a doctor speaks with a patient. This simply means that it appears the medical interpreters will likely need to come from the United States.

There is still a lot of work to be done before utilizing telemedicine between the United States and Nicaragua can become a reality. The biggest and most difficult problem to overcome is the large number of people in Nicaragua that currently do not have access to internet access. To solve this, the geographical obstacles throughout Nicaragua either need to be overcome or the Nicaraguan government needs to implement laws that would drive internet companies to be competitive instead of allowing Claro and Enitel to remain monopolies. The number of medical interpreters in the United States and ideally Nicaragua needs to also increase more before this approach to medicine can be possible. This will likely just take time, as these numbers are already rapidly increasing. I firmly believe that while this will not be an easy task to accomplish, it is absolutely worthwhile to provide healthcare to people who would never have access to it otherwise.

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